

### A.3.7 LIVING WITH A STAR (LWS) TARGETED RESEARCH AND TECHNOLOGY

#### 1. Scope of Program

The goal of the Sun Earth Connection (SEC) Living With a Star (LWS) program is to develop the scientific understanding necessary to enable the U.S. to effectively address those aspects of the connected Sun-Earth system that affect life and society. To answer these questions, this LWS Targeted Research and Technology (TR&T) program element solicits proposals that provide both physics-based understanding as well as experimental measurements to test our knowledge of the Sun-Heliosphere-Earth system. This objective can be achieved by exploiting data from past and present space missions for scientific analysis, theory, and modeling efforts as well as technology improvements that contribute to operational answers concerning specific areas relevant to societal needs. LWS is recognized as a cross-cutting initiative whose goals and objectives have the following links to four NASA Strategic Enterprises, namely:

- Space Science - LWS seeks to quantify the physics, dynamics, and behavior of the Sun-Earth system over the 11-year solar cycle;
- Earth Science - LWS pursues improving our understanding of the effects of solar variability and disturbances on terrestrial climate change;
- Human Exploration and Development - LWS develops knowledge of advanced warning capabilities of solar energetic particles that may affect the safety of humans in space; and
- Aeronautics and Space Transportation - LWS seeks further detailed characterization of the radiation environments useful for the design of more reliable electronic subsystems for air and space transportation systems.

The LWS TR&T component supports individual targeted research tasks that employ a variety of research techniques in pursuit of LWS program goals. Investigations may analyze data from past and present NASA spacecraft or data from other nations and agencies that are in the public domain. Specifically, the LWS program addresses five objectives:

- Scientific Understanding

Theoretical research, the development of models and simulations, and the analysis and interpretation of data for the purposes of identifying and understanding the physical processes important to Sun-Heliosphere-Earth system, which includes boundaries and coupling among systems and phenomena (e.g., Solar atmosphere-heliosphere, heliosphere-magnetosphere, magnetosphere-ionosphere etc.) that meet LWS goals.

- Empirical Tools

Development of new empirical techniques and models for the origin and propagation of solar, interplanetary, and geospace disturbances that provide improved predictive tools and that can be used to mitigate harmful effects on human technologies

(e.g., the discovery of a signature in soft X-ray images of solar regions that indicates a high probability for coronal mass ejections (CME's), or models of the near real-time latitudinal cut-off of solar energetic particles using spacecraft data).

- Understanding Terrestrial Climate

Enhancement of the understanding of the role of solar influences in affecting terrestrial global climate, especially stressing new research investigations that make use of data from past or current space missions and/or support past, current, or possible future space missions, including investigations involving theory, modeling, and historical data on the connections between the behavior of the Sun and climate.

- Characterization of Space Climate

Improvement of our scientific knowledge of space environment conditions and variations over the solar cycle (e.g., enabling cost-effective design of scientific spacecraft and subsystems to minimize space environmental effects and damage); and development of cost-effective techniques for assimilating data from networks of research spacecraft.

- Instrument Concepts

Development of innovative instrument concepts that are less resource intensive (e.g., compact, lighter, low power), more sensitive, and more cost-effective to maximize access to space in support of LWS needs.

Specific suggestions of space science areas of concern may be found in the following documents: the National Academy of Sciences Web tutorial, entitled "*Space Weather: A Research Perspective*" (<http://www.nas.edu/ssb/cover.html>), the report on the Solar Influences Workshop (<http://www.ispe.arizona.edu/research/sunclimate/>), the Sun Earth Connection LWS WWW site (<http://lws.gsfc.nasa.gov/>), the LWS Science Architecture Team report to SECAS ([http://lws.gsfc.nasa.gov/docs/LWSSAT\\_SECASreport\\_30Aug01.pdf](http://lws.gsfc.nasa.gov/docs/LWSSAT_SECASreport_30Aug01.pdf)), and material from the LWS Mission Requirements Workshop material ([http://sec.gsfc.nasa.gov/lws\\_resources\\_presentations.htm](http://sec.gsfc.nasa.gov/lws_resources_presentations.htm)).

The Living With a Star data policy calls for complete and immediate access to all data from LWS missions. Therefore, proposals that promise prompt public access to LWS TR&T data and products is an important objective in the evaluation of submitted proposals. With respect to the development of computer programs, especially appropriate are proposals for those that are or will be demonstrably available in the public domain.

## 2. Programmatic Information

Given the unique aspects of the LWS TR&T objectives, reviewers of submitted proposals will include knowledgeable representatives of the LWS customer community, as well as peer scientists. The evaluation of the intrinsic merit of LWS TR&T proposals will include consideration of the significance of and evidence for tangible advance in achieving at least one of the five primary objectives of the LWS program given in Section 1 above. Since expeditious impact from LWS TR&T is desirable, proposals that promise and can support with a convincing methodology significant results in the near term are particularly appropriate and encouraged.

To aid in the identification of reviewers, it is essential that the electronically submitted *Cover Page* for LWS TR&T proposals include a single choice of discipline descriptor (e.g., G for Geospace and S for Solar & Heliospheric clusters) and the relevant program objective.

An annual call for proposals for LWS TR&T investigations is now planned for the foreseeable future. The total funding available for new proposals submitted through this NRA and to be funded in Fiscal Year (FY) 2003 is expected to about \$6M. Proposals for efforts up to three-years duration are solicited. To give perspective for the number of proposals that may be funded through this program, the average first-year cost of selected awards through the ROSS – 2000 NRA was about \$90K, which does not necessarily exclude funding of larger awards for programs of exceptional merit and breadth.

### **IMPORTANT INFORMATION**

As discussed in the *Summary of Solicitation* of this NRA, the Office of Space Science (OSS) is now using a single, unified set of instructions for the submission of proposals. This material is contained in the document entitled *NASA Guidebook for Proposers Responding to NASA Research Announcement – 2001* (or *NASA Guidebook for Proposers* for short) that is accessible by opening URL <http://research.hq.nasa.gov>, and linking through the menu item "Helpful References," or may be directly accessed online at URL <http://www.hq.nasa.gov/office/procurement/nraguidebook/>. This NRA's Summary of Solicitation also contains the schedule and instructions for the electronic submission of a *Notice of Intent* (NOI) to propose and a proposal's *Cover Page/Proposal Summary*, which now also includes the required *Budget Summary*, and the mailing address for the submission of a proposal.

Questions about this program element may be directed to any of the cognizant Discipline Scientists:

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